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June 14, 1999

Mr. Barry Cohen
Ciba Corporation
Route 37 West
Toms River, NJ 08754

Subject: **Additional Pumping Well**
Ciba-Geigy Site, Cranston, Rhode Island

Dear Barry:

URS Greiner Woodward-Clyde (URSGWC) has reviewed the data pertaining to groundwater capture in the Production Area of the Ciba-Geigy Site in Cranston, Rhode Island. Based on data collected from the Site (i.e., potentiometric maps, groundwater capture analyses, and pumping well operational data) one new well, PW-130, will be required to capture groundwater that is not within the current capture zones of pumping wells PW-110 and PW-120. This new well will minimize groundwater discharges to the Pawtuxet River from the former Production Area of the Site. The following are our recommendations for well PW-130.

WELL LOCATION

PW-130 will be located approximately 83 feet northeast of PW-120 and 125 feet southwest of PW-110, at a distance of about 15 feet from the bulkhead. This location is based on the predicted capture zone analysis of well PW-130. The capture zone of PW-130 is predicted to overlap the capture zones of PW-110 and PW-120 based on calculations provided in Attachment A of this letter. The capture zones of PW-110 and PW-120 have been determined based on actual operations data as shown on the attached Figure 1. The predicted capture zone of PW-130 is also drawn on the same figure.

WELL DESIGN

The design of PW-130 shown on Figure 2. This design is based on the geologic information presented in the Stabilization Investigation Report and is proposed to be similar to PW-120. PW-130 will contain two screened intervals from 7 to 17 and from 28 to 38 feet below the ground surface.

OPERATIONAL PUMPING RATE

The pumping rate predicted for PW-130 to maintain the required capture zone between PW-110 and PW-120 is between 3 to 8 gallons per minute. Calculations predicting this flow rate are provided in the attachment.

If you have any questions or require any additional information regarding the material transmitted herewith, please call either myself at 201-785-0700 or Mark Houlday at 302-992-6967.

Sincerely,

Thomas R. Pisciotta
Senior Project Hydrogeologist

Mark Houlday

Mark Houlday
Project Manager

Attachment

ATTACHMENT A

The aerial extent of the capture zone associated with pumping was calculated using the following relationship, as discussed in Todd (1980) and Grubb (1993):

$$Y = Q/Ti$$

where:

Y	= max. total width of the capture zone (ft) upgradient of the pumping well
Q	= pumping rate (ft^3/min).
T	= transmissivity (ft^2/min).
i	= natural hydraulic gradient (ft/ft).

Q = Constant pumping rate of PW-120 = 0.43 ft^3/min (3.2 gallons per minute - gpm)

T = Transmissivity values in the aquifer in the vicinity of PW-120 which are on the order of 0.3 ft^2/min based on long term operations.

i = 0.015 ft/ft

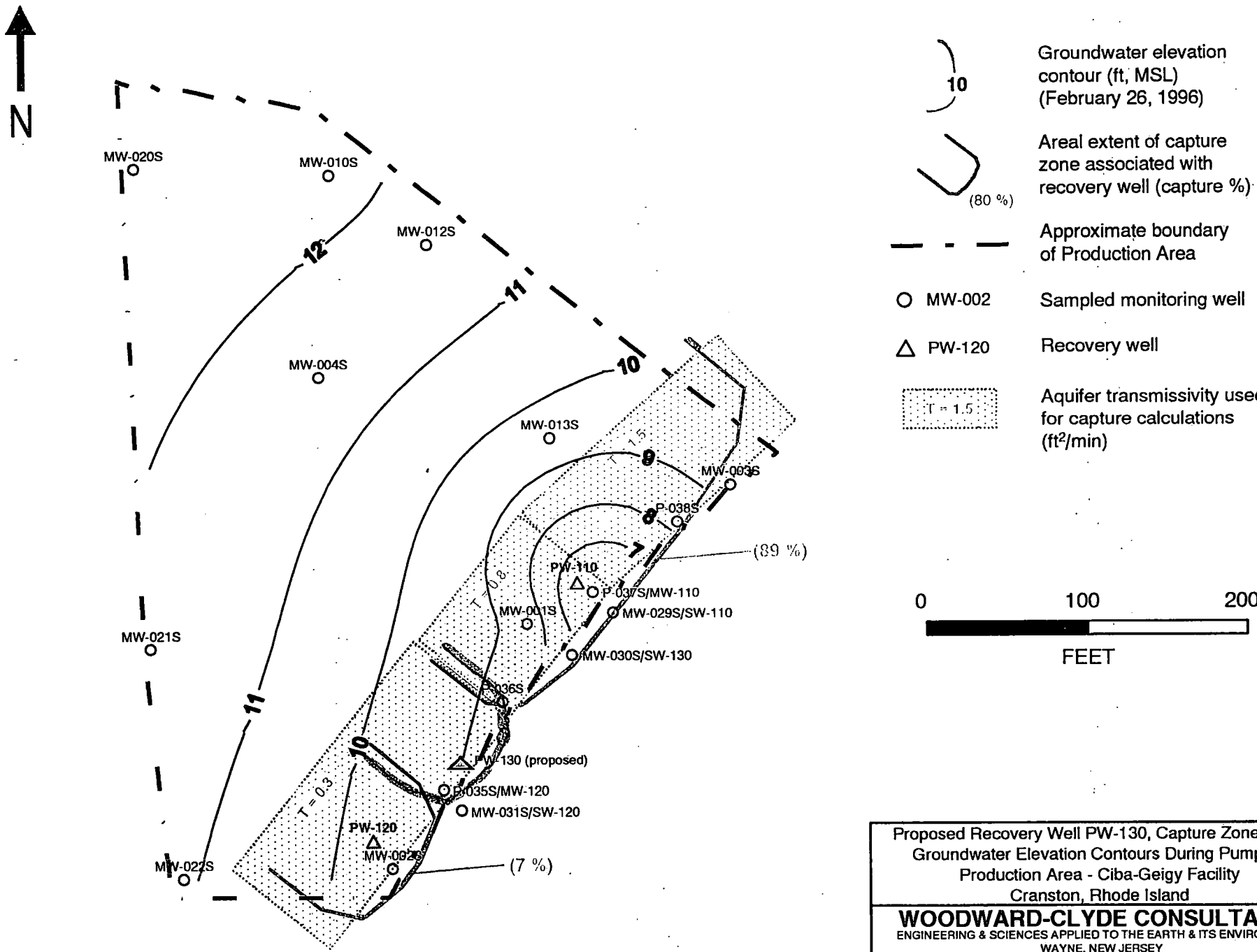
A. The results for the existing pumping conditions at PW-120 are as follows:

Y = 0.43 ft^3/min/ (0.3 ft^2/min)(0.015) = 96 ft.

B. The predicted results for PW-130 are as follows:

1) If Q = 0.43 ft^3/min (3.2 gpm) and T = 0.3 ft^2/min, Y = 96 ft at PW-130 (this is based on the PW-120 results which are expected to be similar at PW-130 based on the site geology)
2) If Q = 0.67 ft^3/min (5.0 gpm) and T = 0.3 ft^2/min, Y = 148 ft
3) If Q = 0.67 ft^3/min (5.0 gpm) and T = 0.8 ft^2/min, Y = 56 ft
4) If Q = 1.07 ft^3/min (8.0 gpm) and T = 0.3 ft^2/min, Y = 236 ft
5) If Q = 1.07 ft^3/min (8.0 gpm) and T = 0.8 ft^2/min, Y = 90 ft

Based on these calculations, the pumping rate of PW-130 that is needed to maintain the required capture zone width of 100 feet in the area between PW-110 and PW-120 is predicted to range between 3 and 8 gpm.



Proposed Recovery Well PW-130, Capture Zones and Groundwater Elevation Contours During Pumping
Production Area - Ciba-Geigy Facility
Cranston, Rhode Island

WOODWARD-CLYDE CONSULTANTS
ENGINEERING & SCIENCES APPLIED TO THE EARTH & ITS ENVIRONMENT
WAYNE, NEW JERSEY

DR. BY: trp	SCALE: AS SHOWN	PROJ. NO.: 87X4660D
CK'D. BY: GRJ	DATE: JUN 9, 1999996	FIG. NO.: 1

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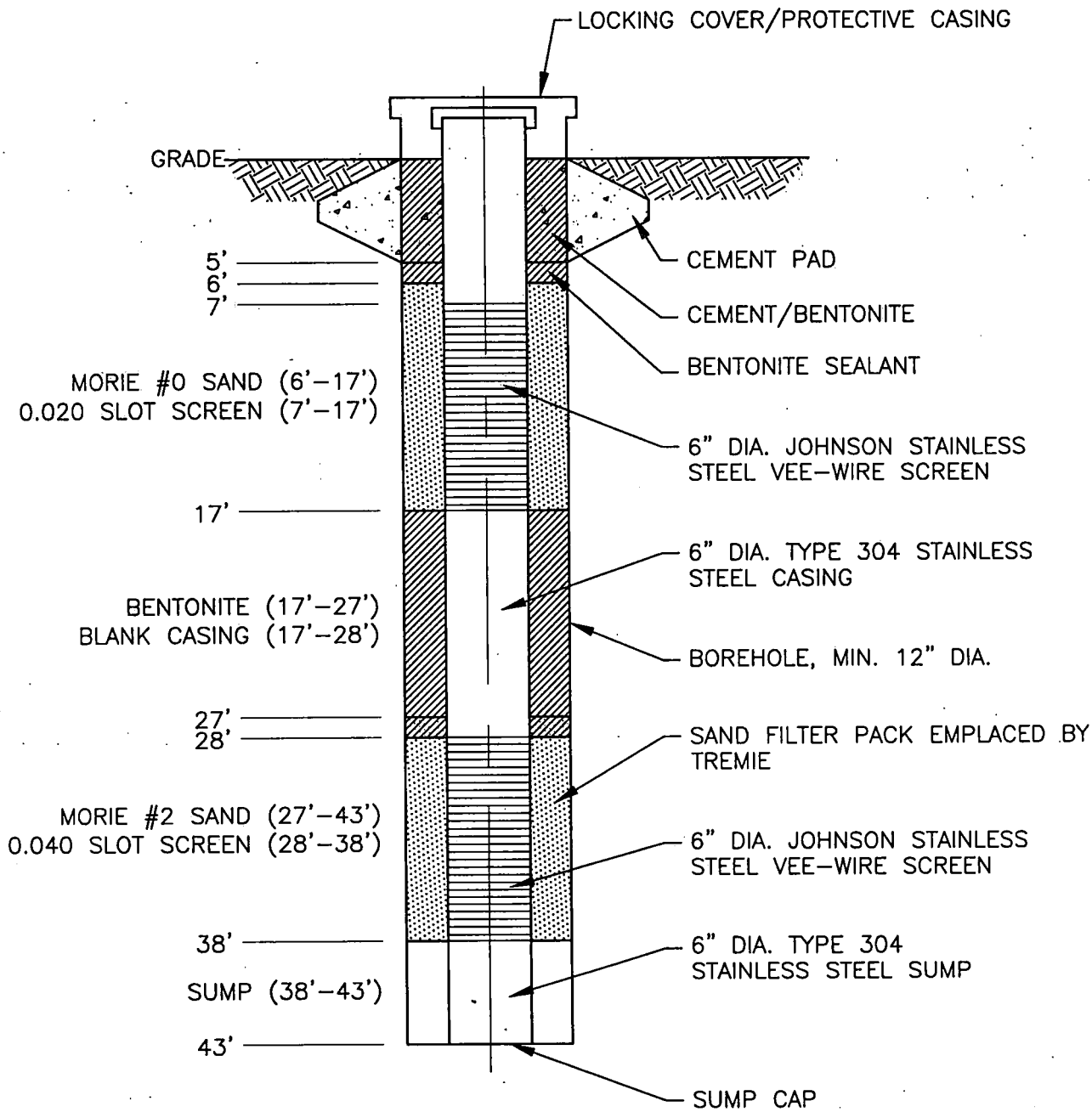

0 4 8 16

VERTICAL SCALE (FEET)

HORIZONTAL NOT TO SCALE

WELL CONSTRUCTION DETAILS PW–130

URS Greiner Woodward Clyde
WAYNE, NEW JERSEY

DR. BY	JL	SCALE	AS SHOWN	DWG. NO. 74660200	PROJ. NO. 87X4660D
CK'D. BY	TP	DATE	JUN 8, 1999	FIG. NO.	2

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